Moxa TCC-100 Series User's Guide

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Moxa TCC-100 Series User's Guide

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Technical Support Contact Information
www.moxa.com/support

Moxa Americas:
Toll-free: 1-888-669-2872
Tel: +1-714-528-6777
Fax: +1-714-528-6778

Moxa China (Shanghai office):
Toll-free: 800-820-5036
Tel: +86-21-5258-9955
Fax: +86-10-6872-3958

Moxa Europe:
Tel: +49-89-3 70 03 99-0
Fax: +49-89-3 70 03 99-99

Moxa Asia-Pacific:
Tel: +886-2-8919-1230
Fax: +886-2-8919-1231

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1
Introduction

TCC-100 Series is an RS-232 to RS-422/485 media converter. Note that TCC-100I/TCC-100I-T comes with 2 KV isolation protection.

The following topics are covered in this chapter:

- **Overview**
- **Product Features**
- **Package Checklist**
- **Product Specifications**
- **Schematic**
- **LED Indicators**

Overview

Introduction

Many important devices used in today's industrial environment are still designed for use with an RS-232 interface. The reason is due in part to tradition, and in part to convenience. RS-232 hardware is relatively easy to design, and the device can be readily connected to most PCs. The drawback is that RS-232 is a point-to-point interface, and it imposes a distance limitation of only 15 meters between the device and the computer.

To overcome these limitations, many users employ RS-232 to RS-422/485 converters, allowing RS-232 devices to connect to an industrial RS-422 or RS-485 network and transmit data over distances up to 1.2 km. The RS-422/485 standards overcome the distance limitation by using a differential signal for transmitting data and control signals. Transmission distance and multi-drop connections are not the only issues of importance for industrial applications In addition, housing, wiring, power supply, and over-surge protection are also serious concerns.

TCC-100 Series provides isolation protection for users who need an industrial grade interface conversion product to extend RS-232 transmission distance and increase networking capability. Its superior industrial application design, which includes DIN-Rail mounting, terminal block wiring, external terminal block power, and optical isolation for system protection, makes TCC-100 Series suitable for use in critical industrial environments. Simply put, your RS-232 devices can be used as part of an industrial RS-422/485 network, but without any hardware or software changes.

RTS/CTS RS-422 Handshaking Signals

TCC-100 Series provides RS-422 handshaking signal support. The RTS and CTS signals help solve the RS-422 signal handshaking problem and reduce data transmission errors.

Built-in RS-485 ADDC™ Intelligence

ADDC™ (Automatic Data Direction Control), a Moxa leading technology, uses a clever hardware solution to manage RS-485's data flow control problem. ADDC™ is a hardware data flow solution that automatically senses and controls data direction, making the handshaking signal method obsolete.

Isolation

Moxa's electrical isolation technology uses two photo couplers to create a gap in each electrical signal. One photo coupler transforms the electrical signal into a light signal, which is transmitted across a small gap, and then the other photo coupler transforms the light back into an electrical signal. In this way, the two electrical circuits are completely isolated from each other, limiting the damage that could otherwise be caused by power surges in the electrical signal.

Reverse Power Protection

The Reverse Power Protection feature provides extra protection against accidentally connecting the power cables to the wrong terminal. The converter is designed to automatically detect which power wire is positive and which is negative, and then adjust the power supply accordingly.

DIP Switch Selectable Terminator

For many products of this type, the termination resistor is set by a jumper located inside the product's casing, so that the user must open the casing to disable or change the resistor's strength. Moxa offers a better solution. TCC-100 Series's terminator is set with a DIP Switch located on the outside of the converter's casing.

Auto Baud Rate Detection

TCC-100 Series incorporates a method for automatically detecting the serial signal's baud rate by hardware. This is an extremely convenient feature for the user. Even if a device's baud rate changes, the signal will still be transmitted through the RS-232 to RS-422/488 converter without any problem.

Product Features

- RS-232 to RS-422 conversion with RTC/CTS support
- RS-232 to 2/4-wire RS-485 conversion
- Detachable wall and DIN-Rail mounting for easy RS-422/485 wiring
- PWR, Tx, and Rx LEDs
- 15 KV ESD Protection
- 2 KV Isolation (TCC-100I/TCC-100I-T) for both power and RS-422/485 signals
- Operating temperature
  TCC-100/100I -20 to 60°C (-4 to 140°F)
  TCC-100-T/100I-T -40 to 85°C (-40 to 185°F)

Package Checklist

Before installing Moxa TCC-100 Series, verify that the package contains the following items:

- TCC-100 Series
- User's Manual (this document)
- Warranty Booklet

Please notify your sales representative if any of the above items is missing or damaged.

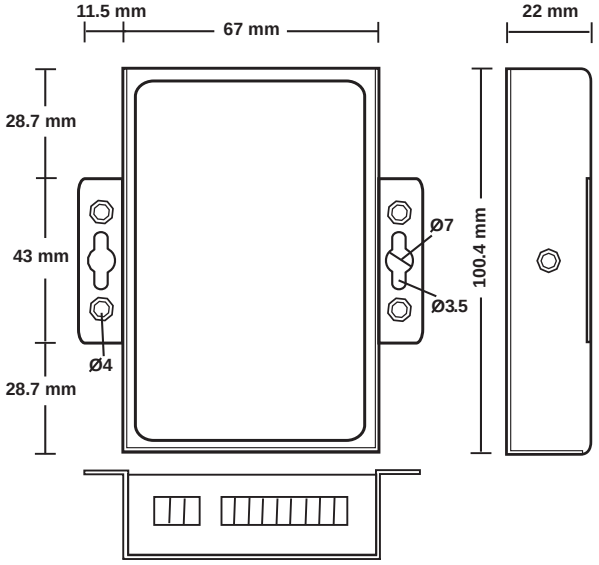
Product Specifications

Model Names	TCC-100 Series
Communication	
RS-232 Signal	Supports Tx, Rx, RTS, CTS; Female DB9 interface
RS-422/485 Signal	Terminal Block connector (DIP Switch selectable) 4-wire RS-422 (with RTS/CTS), up to 10 nodes (1.2 km) 4-wire RS-485: up to 32 nodes (1.2 km) 2-wire RS-485: up to 32 nodes (1.2 km)
RS-485 Data Direction Control	ADDC™
Baud Rate	50 bps to 921.6 Kbps
ESD Protection	15 KV
Isolation	2 KV (TCC-100I/TCC-100I-T) for both Power and Signal
Environment	
Operating Temperature	TCC-100/TCC-100I: -20~60°C (-4 to 140 °F) TCC-100-T/TCC-100I-T: -40 to 85°C (-40 to 185 °F)
Storage Temperature	-20 to 85°C (-4 to 185°F)
Humidity	5 to 95 %RH
Power	
Input Power Voltage	External Power 12-48 VDC, Terminal Block
Reverse Power Protection	Protects against V+/V- reversal
Over Current Protection	Protects against 2 signals shorted together
Power Consumption	TCC-100/TCC-100-T: 300mA @12V TCC-100I/TCC-100I-T: 400mA @12V
Mechanical	
Dimensions (W × D × H)	67 × 100 × 22 mm (without DIN-Rail mounting kit) 90 × 100 × 22 mm (with DIN-Rail mounting kit)
Case	Aluminum
Plug-In Screw Terminal Block	#22 – #16 AWG
Weight	148±5 g
Regulatory Approvals	CE, FCC (Class B)

WARNING

1. This unit is not meant to be sold to consumers. It will only be shipped to manufacturers of factories.
2. The DC source should come from an external adapter or 12 to 48 VDC source (not from DC mains) by using a transfer device.
3. This unit should be installed or set up by a qualified service person.

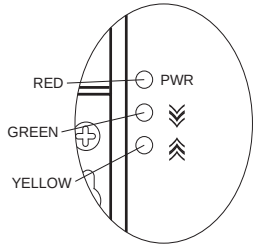
Schematic



LED Indicators

TCC-100 Series's top panel contains three LED indicators, as described in the following table:

LED Name	LED Function
PWR	Red indicates the power is on.
⩔	Green indicates TCC-100 Series is receiving data from the RS-232 port.
⩓	Yellow indicates TCC-100 Series is receiving data from the RS-422/485 port.



2
Installation

This chapter includes information about how to install TCC-100 Series, as well as function and block diagrams.

The following topics are covered in this chapter:

- **Hardware Installation**
- **Termination Resistor Diagram**
- **Function Diagram**
- **Isolation Block Diagram**
- **Typical Applications**

Hardware Installation

Installing TCC-100 Series involves five straightforward steps:

- **STEP 1**: Set the DIP Switches
- **STEP 2**: Attach the Power Supply
- **STEP 3**: Wire the Terminal Block
- **STEP 4**: Attach the RS-232 Converter
- **STEP 5**: Test the Connection

The details of each of these five steps are described next.

STEP 1: Set the DIP Switches

The DIP Switches on TCC100/100I are used to set the signal transmission mode and enable or disable the termination resistor. You can configure for either RS-422 or RS-485 transmission mode. Your program and serial port should be set to match the converter's settings.

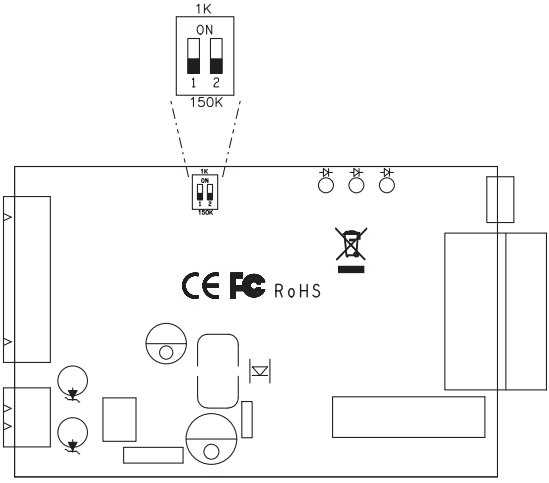
SW1—Switch 1 selects RS-422 or RS-485 mode. The default is "On" for RS-422 mode.

SW2—Switch 2 selects 2-wire or 4-wire RS-485 mode. The default is "On" for 4-wire RS-485. Note that if Switch 1 is set to RS-422 mode, then Switch 2 is inactive.

SW3—Switch 3 enables the terminator to 120 Ohms. When enabled, the 120 Ohm resistor prevents signal reflection during RS-485 transmission. The default is "On" to enable the terminator. If your particular application does not require using the termination resistor, then simply set Switch 3 to the off position to disable it.

Dip Switch Settings				
RS-422 Terminator active	SW1	SW2	SW3	
	ON	ON	ON	
RS-422	SW1	SW2	SW3	
	ON	ON	OFF	
4-wire RS-485 Terminator active	SW1	SW2	SW3	
	OFF	ON	ON	
4-wire RS-485	SW1	SW2	SW3	
	OFF	ON	OFF	
2-wire RS-485 with Terminator	SW1	SW2	SW3	
	OFF	OFF	ON	
2-wire RS-485	SW1	SW2	SW3	
	OFF	OFF	OFF	

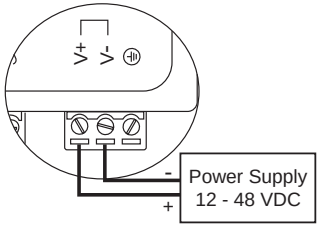
The newly implemented DIP-2 Switches are used to configure the pull high/low resistors for different applications.



Pull High/Low Resistor	DIP-2 SW1	DIP-2 SW2
150K	OFF	OFF
1K (default)	ON	ON

NOTE We recommend setting the pull high/low resistor to 1K (ON/ON) when termination is enabled.

STEP 2: Attach the Power Supply

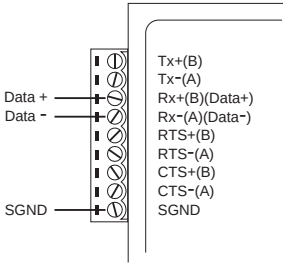


TCC-100 Series is powered by an external 12 to 48 VDC power supply. To connect the power supply, run two wires from the V+ and V- terminals on TCC's 3-connector terminal block to the DC power supply, as shown in the figure. Once the power supply is connected to its power source, the PWR LED located on TCC's top panel should become illuminated in red.

NOTE: TCC-100 Series provides reverse power protection. I.e., it will automatically detect which power wire is negative, and which is positive.

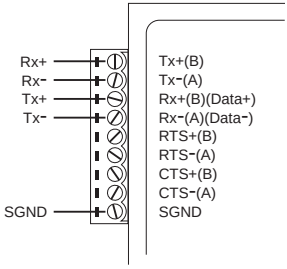
STEP 3: Wire the Terminal Block

There are three wiring options available for connecting to TCC-100 Series's RS-422/485 terminal block.



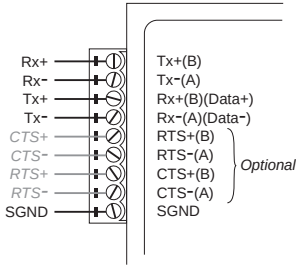
2-wire RS-485

When using the 2-wire RS-485 wiring option, connect three wires from TCC-100 Series's terminal block to the opposite connection. As shown in the figure, connect from Data+ to Data+, from Data- to Data-, and from SGND to SGND.



4-wire RS-485

When using the 4-wire RS-485 wiring option, connect five wires from TCC-100 Series's terminal block to the opposite connection. As shown in the figure, connect from Tx+(B) to Rx+, from Tx-(A) to Rx-, from Rx+(B) to Tx+, from Rx-(A) to Tx-, and from SGND to SGND.



RS-422

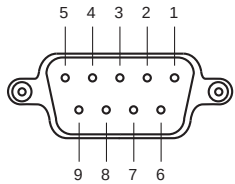
When using the RS-422 wiring option, first follow the 4-wire RS-485 wiring instructions given above.

Optional RTS/CTS Handshaking Signals

If your software is set up to send and receive RTS/CTS signals over separate wires, you should also connect from RTS+(B) to CTS+, from RTS-(A) to CTS-, from CTS+(B) to RTS+, and from CTS-(A) to RTS-.

STEP 4: Attach the RS-232 Connector

Depending on your application, use the appropriate serial cable to connect from CC-100/100I's RS-232 Female DB9 port to your RS-232 device, or to your computer's COM port.



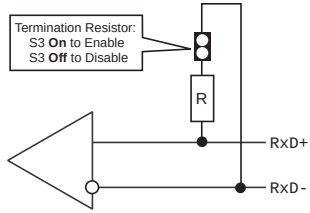
PIN	RS-232
1	---
2	TxD
3	RxD
4	---
5	GND
6	---
7	CTS
8	RTS
9	---

RS-232 Pin Assignment Diagram

STEP 5: Test the Connection

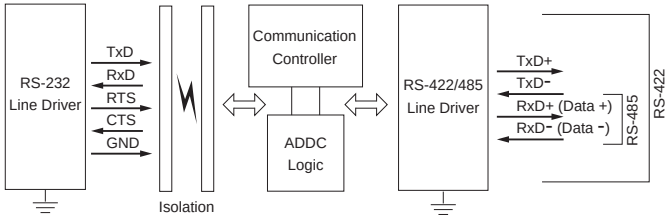
After setting the DIP Switches, connecting the power, wiring the terminal block, and attaching the RS-232 connector, we suggest using a Console Terminal program, such as HyperTerminal or Moxa Terminal Emulator, to test the connection. If you have an RS-422/485 serial board (such as Moxa CP-132, a 2-port RS-422/485 board) installed in your PC, you can connect your PC's COM port to TCC-100 Series's RS-232 port, and then connect TCC-100 Series's RS-422/485 terminal block to one of the RS-422/485 serial board's ports. Alternatively, if you have already set up an RS-422 or RS-485 network, you can also connect TCC-100 Series's RS-422/485 terminal block directly to that network. Next, start HyperTerminal or Moxa Terminal Emulator, and then open a connection to both the COM port, and the port associated with TCC-100 Series's RS-422/485 port. Simply type a few characters on your PC's keyboard. The characters you type should show up in the HyperTerminal window that is currently inactive, indicating that the typed characters were transmitted between TCC-100 Series's RS-232 port and RS-422/485 terminal block connector.

Termination Resistor Diagram

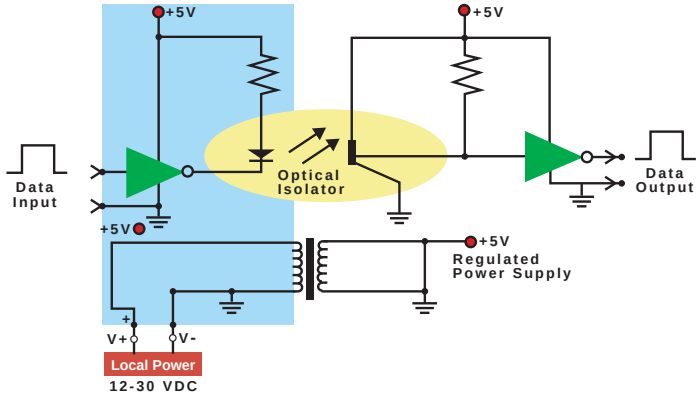


Termination is designed to mitigate noise from the RS-422/485 transmission signals. If the network cable is too long, undesirable transmission-line effects will arise. The best method for mitigating energy on an unused conductor is to dissipate the energy as heat by terminating both ends of the unused conductor to ground with resistors (so-called bi-directional termination). The resistance of the resistors should be equal to the characteristic impedance of the line. The most common RS-485 twisted pair has a characteristic impendence of 100-120 Ohm. Moxa's termination technique is bi-directional termination, which offers excellent signal integrity. With this technique, the line drivers can be located anywhere on the network.

Function Diagram



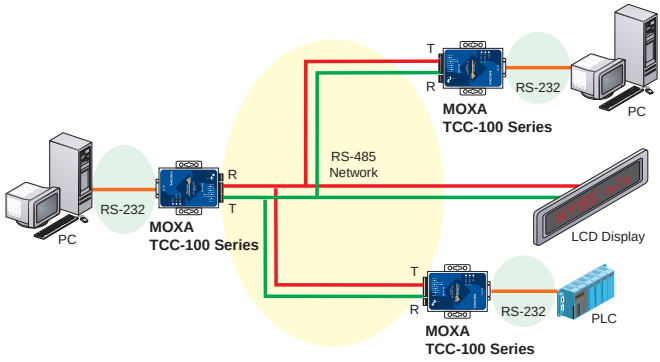
Isolation Block Diagram



Typical Applications

RS-485 Application

A typical RS-485 application for TCC-100 Series is depicted in the following figure. In this scenario, two TCC-100 Series units are used to connect two PCs to an RS-485 network. The third TCC-100 Series is used to connect the PLC—which is designed for the RS-232 interface—to the RS-485 network. In this way, both PCs are able to interact with the PLC and the LCD Display.



RS-422 Application

A typical RS-422 application for TCC-100 Series is depicted in the following figure. In this scenario, two TCC-100 Series units are used to create a point-to-point connection between a PC and Scales. The advantage of using two TCC-100 Series units to convert from RS-232, to RS-422, and then back to RS-232, is that the RS-422 cable connecting the two converters can be up to 1.2 km in length (this is quite an improvement compared to the 15-m distance limitation imposed by the RS-232 interface).